

## Effect of Different Soil Moisture Regime on the Yield and Yield Components of Onion

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### Introduction

Onion (*Allium cepa* L.) is the main spice crop grown in Bangladesh. It is used in almost all food preparation and is an integral part of Bangladesh diet.<sup>1</sup> Onion is grown in 35,000 hectare land and its total production is 1.40 lac ton.<sup>2</sup> It is grown more or less in all the districts of Bangladesh but the average yield is 4.17 t/ha<sup>2</sup> which is very low as compared to other developed countries like USA (42 t/ha), Japan (44.7 t/ha) and South Korea (53 t/ha) as reported by Pathak.<sup>3</sup> The average world production at present is about 15 t/ha.<sup>3</sup> Among various factors affecting its production, the role of irrigation assumes greater significance. Onion needs frequent irrigation but it does not tolerate water logging condition. Recently the climatological approach has come out to be the most reliable device for scheduling irrigation. The present study was therefore, undertaken to find out optimum irrigation schedule and water requirement of onion.

### Materials and Methods

The field experiment was conducted at Grey Terrace Soil of Gazipur (AEZ-28) during rabi seasons of 1990-2000 and 2000-2001. Five

regimes of irrigation (control, 0.50, 0.75, 1.00 and 1.25 IW/CPE ratio with 4 cm depth of irrigation water at each irrigation) were tried in randomized complete block design (RCBD) with four replications. One common irrigation of 4 cm depth was given just after transplanting and the subsequent irrigations were timed on the basis of different IW/CPE ratios. The total number of irrigations including a common irrigation, irrigation schedules of control, 0.50, 0.75, 1.00 and 1.25 IW/CPE ratio were 1, 3, 4, 5 and 6, in both years respectively. Five week old seedling of line ON-0193 were transplanted on 6th and 1st December, 1999 and 2000, respectively and the crop was harvested on 20th and 12th March, 2000 and 2001, respectively. Unit plot size was 2m x 1m. The spacing was 20 cm between rows and 10 cm between plants. Uniform dose of 120 kg N/ha as urea, 90 kg P<sub>2</sub>O<sub>5</sub>/ha as TSP, 90 kg K<sub>2</sub>O/ha as MP and 20 kg S/ha as gypsum were applied. Half urea and all other fertilizer were applied as basal and rest of urea was applied at 45 DAT. The water table depth was below 3m through out the experimentation. Hence the contribution of ground water was considered to be

negligible. The total rainfall during cropping season were 6.5 cm in 2000 and 5.8 cm in 2001, the bulk of which was received in the March in both year. There was practically no rain during active growth period of the crop in both the year. Five representative plants were harvested from each plot for recording yield attributes of onion.

### Results and Discussion

The yield, yield components and water use efficiency of onion as responded to different soil moisture regime are presented in Table I and Table II. Bulb diameter, bulb length, individual bulb weight and bulb yield/ha increasing upto 1.25 IW/CPE ratio of soil moisture regime, but data obtained from 1.00 IW/CPE ratio and 1.25 IW/CPE ratio are statistically similar. Maximum bulb diameter (5.96 cm in 2000 and 6.08 cm in 2001) obtained from 1.25 IW/CPE ratio which was statistically similar with 1.00 IW/CPE ratio

and comparatively higher from all other treatment. Highest bulb length (5.64 cm in 2000 and 5.68 cm in 2001) obtained from 1.25 IW/CPE ratio which was significantly higher than all other treatment. Maximum individual bulb weight (67.55 g in 2000 and 69.86 g in 2001) was obtained from 1.25 IW/CPE ratio which was identical with bulb weight derived from 1.00 IW/CPE ratio (58.14 g in 2000 and 60.77 g in 2001). Both of above two bulb weight were significantly higher than bulb weight of rest three treatments.

Bulb yield/ha increasing significantly with the increase of soil moisture regime upto 1.00 IW/CPE ratio. Bulb yield /ha was highest in 1.25 IW/CPE ratio (16.32 t/ha in 2000 and 16.59 t/ha in 2001) which was identical with 1.00 IW/CPE ratio (15.08 t/ha in 2000 and 15.36 t/ha in 2001). Percent increase in bulb yield due to 1.25, 1.00, 0.75, 0.50 IW/CPE

**Table I. Effect of different soil moisture regimes on the yield, yield components and water use efficiency of onion during rabi season of 1999-2000**

Soil moisture regimes (IW/CPE ratio)	No. of irrigation	Bulb diameter (cm)	Bulb length (cm)	Bulb weight (g)	Bulb yield (t/ha)	% Yield increase over control	Total water applied including rainfall (cm)	Water use efficiency (kg/ha/cm)
Control	1	1.81d	2.13e	12.52d	5.48d	-	10.50	521.90
0.50	2	2.47c	3.33d	29.49c	8.72c	59.12	18.50	471.35
0.75	3	4.56b	4.45c	44.32b	12.06b	120.07	22.50	536.00
1.00	4	5.48a	5.21b	58.14a	15.08a	175.18	26.50	569.06
1.25	5	5.96a	5.64a	67.55a	16.32a	197.81	30.50	535.06
LSD	-	**	**	**	**	-	-	-
CV(%)	-	6.3	4.8	14.4	8.8	-	-	-

**Table II. Effect of different soil moisture regimes on the yield, yield components and water use efficiency of onion during rabi season of 2000-2001**

Soil moisture regimes (IW/CPE ratio)	No. of irrigation	Bulb diameter (cm)	Bulb length (cm)	Bulb weight (g)	Bulb yield (t/ha)	% Yield increase over control	Total water applied including rainfall (cm)	Water use efficiency (kg/ha/cm)
Control	1	1.87d	2.16e	13.14d	5.67d	-	9.80	578.57
0.50	2	2.51c	3.39d	30.55c	8.89c	59.79	17.80	499.44
0.75	3	4.65b	4.53c	46.41b	12.28b	116.58	21.80	563.30
1.00	4	5.59a	5.28b	60.77a	15.36a	170.90	25.80	595.35
1.25	5	6.08a	5.68a	69.86a	16.59a	192.59	29.80	556.71
LSD	-	**	**	**	**	-	-	-
CV(%)	-	7.0	6.2	9.7	7.9	-	-	-

ratio over control were 197.81, 175.18, 120.07 and 59.12 in 2000 and 192.59, 170.90, 116.58 and 56.79 in 2001, respectively. Liberal water supply (1.25 or 1.00 IW/CPE ratio) increased bulb diameter, bulb length and individual bulb weight which resulted increased bulb yield of onion, confirming the results of Singh and Sharma<sup>4</sup>; Hegde<sup>5</sup> and Palled *et al.*<sup>6</sup>

Total water use for onion varied from 10.50 to 30.50 cm in 2000 and 9.80 to 29.80 cm in 2001. Highest water use efficiency (569.06 kg/ha/cm in 2000 and 595.35 kg/ha/cm in 2001) was obtained from soil moisture regimes of 1.25 IW/CPE ratio which received 6 irrigations giving bulb yield of 15.08 t/ha in 2000 and 15.36 t/ha in 2001.

### Conclusion

Soil moisture regime 1.00 IW/CPE ratio (5 irrigations 1, 20, 35, 55 and 70 days after

transplanting) was found optimum for onion production in Grey Terrace Soil of Gazipur.

### References

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